THE CLAIMS

What is claimed is:

1. A tissue processor comprising:

   (a) a retort chamber for processing tissue;

   (b) a wax storage chamber comprising one or more wax containers;

   (c) a reagent storage chamber comprising one or more reagent containers;

   (d) a fluid transporting system communicatively connected with the retort chamber, said fluid transporting system comprising a selector for selectively connecting the retort chamber with any one of the wax containers or the reagent containers; and

   (e) multiple heating elements for heating the retort chamber, the wax storage chamber, and all or any parts of the fluid transporting system;

   (f) a pumping system communicatively connected with the retort chamber for pneumatically driving fluid into or out of the retort chamber via said fluid transporting system; and

   (g) a computerized central control system for automatic monitoring and managing components (a)-(f).

2. The tissue processor of claim 1, wherein the wax containers and reagent containers are configured to be installed in slots in their respective storage chambers.

3. The tissue processor of claim 2, wherein the wax containers and reagent containers comprise interchangeable plastic bottles.

4. The tissue processor of claim 2, wherein each wax or reagent container comprises a quick-connect device for establishing fluid communication from such container to the selector of the fluid transporting system, so that such container can be selectively connected to the retort chamber.

5. The tissue processor of claim 1, wherein the selector of the fluid transporting system comprises a rotary valve.

6. The tissue processor of claim 5, wherein the selector of the fluid transporting system further comprises a Maltese Cross gear mounted to the rotary valve, which only allows the rotary valve to rest at a set of predetermined positions, at each of which the rotary valve is aligned so as to establish a fluid communication path that connects a particular wax or reagent container with the retort chamber.

7. The tissue processor of claim 5, wherein the selector of the fluid transporting system further comprises a position sensor for monitoring a current position of the rotary valve.

8. The tissue processor of claim 7, wherein the position sensor is operatively connected to the central control system to provide data regarding the instant position of the rotary valve.

9. The tissue processor of claim 8, wherein the central control system is capable of receiving a command from an operator and instructing the selector to rotate the rotary valve to a specified position according to said command.

10. The tissue processor of claim 8, wherein the central control system is capable of outputting data regarding the instant position of the rotary valve.

11. The tissue processor of claim 1, wherein the wax storage chamber and the fluid transporting system are coextensively positioned in a unitary housing.

12. The tissue processor of claim 11, wherein the wax storage chamber and the fluid transporting system are co-heated by common heating elements.

13. The tissue processor of claim 11, wherein the fluid transporting system is indirectly heated by heating elements mounted on the wax storage chamber.

14. The tissue processor of claim 1, wherein the retort chamber, the wax storage chamber, and/or the fluid transporting system are heated to a temperature sufficient for maintaining wax in a liquid state without burning said wax.

15. The tissue processor of claim 1, wherein the wax storage chamber is heated by 5 to 15 heating elements.

16. The tissue processor of claim 15, wherein said 5 to 15 heating elements are divided into three groups: internal, external, and supplemental, wherein each group is controlled by its own relay on a relay board, and wherein said heating elements are positioned as follows:

(a) at least one internal heater between each two wax containers inside the wax storage chamber;

(b) at least one external heater on each side wall and floor of the wax storage chamber; and

(c) at least one supplemental heater on each side wall of the wax storage chamber that is proximate to the fluid transporting system.

17. The tissue processor of claim 1, wherein the central control system comprises means for monitoring and controlling pressure and/or temperature within the retort chamber.

18. The tissue processor of claim 1, wherein the central control system is constructed and arranged to execute a reagent management program.

19. The tissue processor of claim 18, wherein the reagent management program enables the central control system to: (1) store the number of uses of each reagent, and (2) when a particular type of reagent is to be used, instruct the tissue processor to use the least used reagent of said type.

20. The tissue processor of claim 18, wherein such reagent management program further enables the central control system to output information regarding available wax and reagents loaded in the tissue processor.

21. The tissue processor of claim 18, wherein such reagent management program further enables the central control system to: (1) detect a need for replacement of wax or reagent in a wax or reagent container, according to operational limits that are predetermined or otherwise specified by an operator, and (2) communicate such need to the operator through an output device.

22. The tissue processor of claim 18, wherein such reagent management program further enables the central control system to accept and store input by an operator defining operational limits regarding usage of wax or reagent.

23. The tissue processor of claim 22, wherein the input comprises an operator-assigned limit for each container based on cumulative weight of tissue specimens processed.

24. The tissue processor of claim 22, wherein the input comprises an operator-assigned limit for each container based on the number of tissue processes conducted and/or the number of tissue cassettes processed.

25. The tissue processor of claim 24, wherein the reagent management program further enables the central control system to accept commands from the operator to zero the number of processes conducted and/or the number of cassettes processed for one or more containers.

26. The tissue processor of claim 24, wherein the reagent management program further enables the central control system to automatically zero the number of processes conducted and/or the number of cassettes processed for one or more containers, when one or more of the following functions are selected:

(a) changing reagent management mode from single container mode to group mode or vice versa;

(b) activating or deactivating the reagent management program; and

(c) modifying a definition of a reagent group and/or a limit of a reagent group.

27. The tissue processor of claim 22, wherein the reagent management program enables the central control system to operate in a single container mode, in which:

(a) each container is managed as a separate entity;

(b) each container is assigned a defined usage limit depending on the specific type of reagent it contains;

(c) when said usage limit of a container is reached, the central control system outputs an indication that the limit is reached, and optionally prompts replacement of the container.

28. The tissue processor of claim 22, wherein the reagent management program enables the central control system to operate in a group container mode, in which:

(a) each container is managed as a member of a container group containing the same or similar type of reagents;

(b) each group is assigned a defined usage limit depending on the specific type of reagents it contains;

(c) the central control system monitors usage of reagent from each container in a particular group;

(d) the containers in such group are used according to an order determined by the central control system so that for each tissue process, reagent from the least used container is used first; and

(e) when said usage limit of a group is reached, the central control system outputs an indication that the limit is reached, and optionally prompts replacement of reagent in the most used container.

29. The tissue processor of claim 1, wherein the central control system is capable of executing a reverse processing program for reverse-processing of tissue samples that have already been processed.

30. The tissue processor of claim 29, wherein the reverse processing program enables the central control system to instruct the tissue processor to execute steps of a tissue processing protocol in reverse order, starting at the last non-zero time of such tissue processing protocol.

31. The tissue processor of claim 1, wherein the pumping system is configured to alternatively:

(a) lower pressure in the retort chamber to below the ambient by draining air out of said retort chamber, thereby forcing wax or reagent to flow into the retort chamber from a wax or reagent container via the fluid transporting system; and

(b) raise pressure in the retort chamber to above the ambient by pumping air into said retort chamber, thereby forcing wax or reagent out of the retort chamber and back into the wax or reagent container via the fluid transporting system.

32. The tissue processor of claim 1, further comprising one or more purge reagent containers constructed and arranged to be selectively connected to the retort chamber by the selector of the fluid transporting system, for purging the retort chamber with purge reagent to remove wax residues from the retort chamber.

33. The tissue processor of claim 1, further comprising at least one wax purification device for bubbling air through the wax containers to remove contaminants.

34. The tissue processor of claim 1, further comprising a filtering system for removing contaminants from air discharged by the tissue processor.

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